

A Finely Crafted O'Brien Unit 2 Opportunity Day

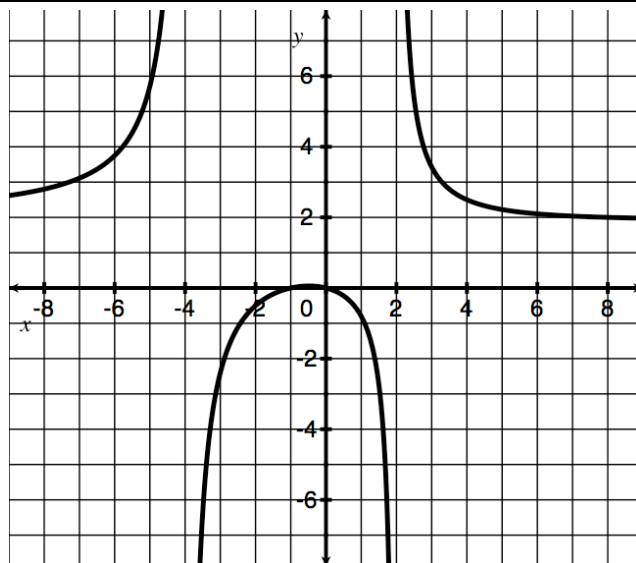
Calculator Section: You may use a calculator. Show all work and circle your answer. Use your time wisely; you will be able to earn additional credit after the timed portion of the test by completing Supercorrections. When you finish, put away your calculator and you can come up to get the non-calculator part- you may continue to work on both sections without your calculator.

1. The graph of $y = \frac{2x(x+1)(x+3)}{(x-2)(x+3)(x+4)}$ is shown at right.

a. Give the equations of the vertical asymptotes.

b. Give the equation of the horizontal asymptote.

c. Give the coordinates (x and y values) of the hole.



2. Find the values of a and b , where a and b are real, given that $(a + bi)(2 - i) = 5 - i$.

3. When the polynomial $x^4 + ax + 3$ is divided by $(x - 1)$, the remainder is 8. Find the value of a .

4. Let $f(x) = \frac{x+4}{x+1}$, $x \neq -1$ and $g(x) = \frac{x-2}{x-4}$, $x \neq 4$.

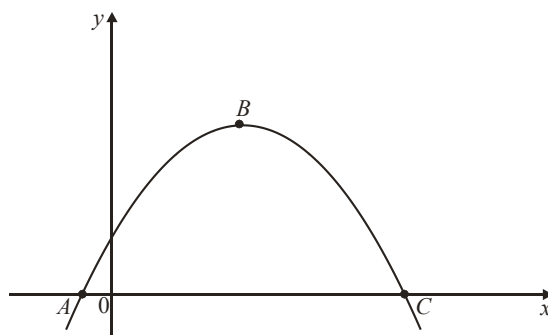
Find the set of values of x such that $f(x) \leq g(x)$.

5. $(x + 2i)$ is a factor of $2x^3 - 3x^2 + 8x - 12$. Find the other two factors.

6. Solve the inequality $x^2 - 4 + \frac{3}{x} < 0$.

7. The diagram shows the parabola $y = (7 - x)(1 + x)$. The points A and C are the x -intercepts and the point B is the maximum point.

Find the coordinates of A , B and C .

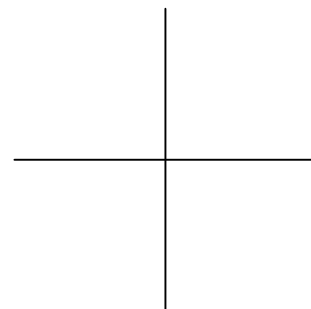


8. Perform the operation and write the result in standard form.

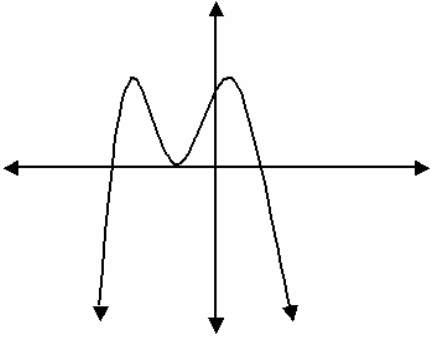
$$\frac{1}{2+i} - \frac{5}{1+4i}$$

9. The function $g(x) = \frac{x^3 + 2x^2}{x^2 + 4x + 1}$ has a slant asymptote. Find the equation of that asymptote.

10. Find the zeros and give a rough sketch of $h(x) = x^3 - 10x^2 + 17x - 8$.



11. Give an equation of a polynomial function that could have the graph below. Explain why your function could have the given graph.



12. The perimeter of a rectangle is 400 meters.

- a. If the length of the rectangle is x and the width is y , then write y as a function of x . Use the result to write the area as a function of x .

- b. Of all possible rectangles with perimeter of 400 meters, find the dimensions of the one with the maximum area.

Bonus: The polynomial $p(x) = (ax + b)^3$ leaves a remainder of -1 when divided by $(x + 1)$, and a remainder of 27 when divided by $(x - 2)$. Find the values of the real numbers a and b .